Section 9C. Water Supply

Introduction

It is the policy of the City to provide safe drinking water at a reasonable cost. The City strives to ensure that the supply is sufficient to meet water-related needs, while employing conservation measures to assure that use does not have a long-term negative impact on the aquifers that provide the City's water.

This section of the *Comprehensive Plan* describes the City's existing water supply system and analyzes future water supply needs. This section includes:

- A brief overview of area **geology**.
- A description of the **existing water supply system**.
- An analysis of **future water supply needs**.
- A discussion of the City's **emergency management** and **conservation** programs.
- Water supply **goals, policies and recommended actions**.

The City prepared a water supply plan for the Minnesota Department of Natural Resources (DNR) and Metropolitan Council. The Plan was accepted by the Metropolitan Council in March 2008, and details of the plan are summarized here.

Geology

The soils found within the City of Shoreview are primarily of two groups – the Twin Cities Formation and Anoka Sand Plain.

The portion of the City located southwest of a line roughly between the Highway 96-Lexington Avenue intersection and the City's southeast corner consists mainly of soils of the Twin Cities Formation. These soils consist of sandy loam to loam underlain at three to four feet by a clay loam and were formed at the southern limit of the Superior and Rainy glacial lobes. These soils are rolling to steeply hilly and are well- to moderately well-drained.

The remainder of the city is comprised of the soils of the southernmost projection of the Anoka Sand Plain, an outwash formed by the retreat of the Grantsburg glacial sublobe. The corresponding landscape is gently rolling fine sand with isolated depressions filled with peat, marsh or lakes. The sand plain soils are well- to excessively-drained, with loamy sand normally found to a depth of one to three feet and fine sand beneath, up to 20 feet or more in depth.

The average permeability rates of the Twin Cities Formation soils are one to three inches per hour, while those of the Anoka Sand Plain are typically 12 to 14 inches per hour. As a result, the

moisture retention capacity of the soils in the City's southwestern one-third is many times greater than that of the soils in the remainder of the city.

The primary aquifers underlying the City of Shoreview, from the most shallow to the deepest, are: Prairie du Chien-Jordan and Franconia-Ironton-Galesville. The Mt. Simon aquifer is also believed to be present below the Franconia-Ironton-Galesville formation in some portions of Shoreview.

The city lies atop a significant underground drift valley, some 150 feet deep and a mile wide, with extensively eroded bedrock formations. Because of this huge subterranean valley, the only portions of the city underlain by the Prairie du Chien-Jordan aquifer are along County Highway 96 from the eastern city limits to near Victoria Street, the area roughly south of I-694 and the northeast corner of the city.

Existing Water Supply System

Source and Supply

The City of Shoreview has no access to suitable surface water sources and relies solely on groundwater. The Prairie du Chien-Jordan aquifer, located approximately 400 feet below the ground surface, serves as the City's municipal water source. The City appropriates water from this aquifer under a permit from the Minnesota Department of Natural Resources (DNR). This permit allows the City of Shoreview to appropriate 1.4 billion gallons of water per year.

All of the City's water supply wells are within a half-mile radius of City Hall. **Table 9C-1** summarizes capacities, dates of implementation, pumping equipment and construction data. **Map 9C-1** shows the City's water supply and distribution system.

The City's estimated 2007 population is 26,981, and the number of residential municipal water connections is 8,069. The total number of service connections is 8,376. The City estimates that about 570 dwelling units (including the 214 units at the Brookside Mobile Home Park) and 8 commercial/institutional uses are served by private wells. Of these, approximately 115 do not have access to the municipal water system. This number will decrease as the City completes road reconstruction projects over the life of this Plan.

Water Treatment and Storage

The City of Shoreview has a total storage capacity of 4.0 million gallons (MG) including two 1.5 MG elevated storage tanks and a 1 MG underground storage reservoir.

The City of Shoreview does not have a water treatment plant. However, the City has centralized pumping for the flow from Well Numbers 2, 3, 4, 5 and 7 with chlorination and fluoridation (with Hydrofluosilicic acid). Chlorination and fluoridation for Well Number 6 are provided at the wellhouse. **Table 9C-1** describes the chemicals used for treatment and related storage facilities.

Table 9C-1. Water Source, Treatment, and Storage Summary

SERVICE AREAS:						
Pressure Zone	The City of Shoreview has only one pressure zone.					
SUPPLY:						
Well No.	2*	3	4	5	7	6
Capacity (gpm)	1749	1250	1250	1749	1400	1600
Capacity (MGD)	2.52	1.80	1.80	2.52	2.02	2.30
Year Installed	1969	1972	1974	1981	1987	1985
Uniqueness Number	206833	206751	206750	151557	432019	151576
Casing Diameter (in)	20-19-12	24-20-16	24-12-10	24-16-10	24-16-10	24-18-10
Casing Depth (ft)	465	297	417	336	325	325
Well Depth (ft)	536	413	437	408	442	414
Formation	One-J	J	One-J	J	J	J
Static Level (ft)	52	55	45	44	64	60
Drawdown (ft)	85	78	60	83	83	75
Pump Type	VT	VT	VT	VT	VT	VT
Motor HP	50	40	40	60	200	150
TREATMENT:	At Booster Station					
Disinfection	Cl2 (Chlorine Gas)					Cl2
Fluoridation	H2SIF6 (Hydroflosilicic)					H2SIF6
Sequestering	NA					C5
GS and PBs:	Underground Reservoir					
Volume (gal)	1.0 MG					
Pump Type	VT/VT/VT/VT					
Capacity (gpm)	3600/3600/3600/3600					
Motor HP	250/250/250/250					
STORAGE:						
Name	Tower 1/South			Tower 2/North		
Type	Hydropillar			Hydropillar		
Volume (MG)	1.5			1.5		
Overflow Elevation (ft)	Grnd EL to bowl bottom=90 ft Bowl bottom to overflow=50 ft			Grnd EL to bowl bottom=136.5 ft Bowl bottom to overflow=50 ft		
Normal Operating Range	36.5 ft to 41.5 ft above the bowl bottom for winter. 44.5 ft to 47.5 ft above the bowl for summer.			36.5 ft to 41.5 ft above the bowl bottom for winter. 44.5 ft to 47.5 ft above the bowl for summer.		
Year Constructed	1973			1983		
Manufacturer	Pittsburgh DesMoines			Pittsburgh DesMoines		

Source: Public Works Department Records

* Well Number 1 is no longer in service; it is used by the United States Geologic Survey for monitoring purposes.

Water Use

Table 9C-2 summarizes annual water use and annual residential consumption.

Table 9C-2. Pumping Records and Per Capita Water Use

Year	Estimated Service Population	Annual Water Pumped (million gallons)	Total Annual Water per Capita per Day (gallons)	Annual Residential Consumption (million gallons)*	Residential Usage per Capita per Day (gallons)*
1997	25,866	995.700	105.5	839.500	88.9
1998	26,026	1,000.700	105.3	888.700	93.6
1999	26,103	904.900	95.0	842.300	88.4
2000	25,833	1,119.000	118.7	875.200	92.8
2001	26,282	1,158.400	120.8	941.366	98.1
2002	26,385	1,017.700	105.7	784.822	81.5
2003	26,382	1,306.000	135.6	978.979	101.7
2004	26,289	1,126.200	117.4	692.058	72.1
2005	26,407	1,142.500	118.5	646.877	67.1
2006	26,706	1,197.200	122.8	705.181	72.3
2007	26,981	1,270.300	129.0	861.834	87.5
Average			**115.8**		**85.8**

Source: Finance Department Utility Records

* Annual water pumped and total annual water per capita per day were calculated based on water pumped in a given year. Residential consumption and residential usage per capita per day were calculated based on water billed in a given year. Annual pumpage and billing records differ slightly because of the delay between actual water use and billing.

Note: The average residential per capita day demand of 87.0 gpcd and the total per capita day demand of 115.0 gpcd is used for the future water usage calculation.

Seasonal and Peak Water Demand

The average water demand over the last five years is 3.3 million gallons per day (MGD). Annual and peak water demands are summarized in Table 9.C-3. The 2007 average amount pumped per day was 3.5 MGD, and the peak or maximum day pumpage was 10.1 MGD.

There is a large seasonal difference between maximum day pumpage and average pumped per day. Most of this difference is assumed to be non-essential summer uses such as lawn watering, car washing and other outdoor uses. The seasonal variation in demand is also evident in the monthly pumping demand data (**Table 9C-4**)

Table 9C-3. Seasonal and Peak Water Demand

Year	Category	Average Day Pumped (million gallons)	Maximum Day Pumped (million gallons)	Peak/Average Ratio
1997	*Annual*	*2.7*		
	Winter	*2.1*		
	Summer	*3.4*	*8.6*	*3.2*
1998	*Annual*	*2.7*		
	Winter	*2.0*		
	Summer	*3.4*	*7.5*	*2.8*
1999	*Annual*	*2.5*		
	Winter	*2.0*		
	Summer	*3.0*	*6.9*	*2.8*
2000	*Annual*	*3.1*		
	Winter	*2.3*		
	Summer	*3.9*	*8.4*	*2.7*
2001	*Annual*	*3.2*		
	Winter	*2.2*		
	Summer	*4.1*	*11.7*	*3.6*
2002	*Annual*	*2.8*		
	Winter	*2.2*		
	Summer	*3.4*	*6.8*	*2.4*
2003	*Annual*	*3.6*		
	Winter	*2.4*		
	Summer	*4.8*	*11.8*	*3.3*
2004	*Annual*	*3.1*		
	Winter	*2.3*		
	Summer	*3.9*	*8.4*	*2.7*
2005	*Annual*	*3.1*		
	Winter	*2.2*		
	Summer	*4.0*	*8.9*	*2.9*
2006	*Annual*	*3.3*		
	Winter	*2.2*		
	Summer	*4.3*	*9.8*	*3.0*
2007	*Annual*	*3.5*		
	Winter	*2.2*		
	Summer	*4.8*	*10.1*	*2.9*
Average Ratio				**2.9**

- The maximum day to average day ratio of 3.0 is used for future maximum day demand calculation.

Source: Finance Department Utility Records

Table 9C-4. 2007 Monthly Water Pumped Demand (MG)

Month	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Total
January	58.4	0.0	0.0	0.0	8.5	0.0	66.9
February	14.5	0.0	0.0	0.0	45.9	0.0	60.4
March	8.7	9.2	18.1	0.0	30.1	0.0	66.1
April	8.9	0.0	5.7	1.4	61.5	0.0	77.5
May	42.7	0.0	4.3	19.2	44.0	13.7	123.9
June	50.2	5.3	7.2	38.7	52.7	20.7	174.8
July	75.1	15.1	13.1	54.0	39.5	28.9	225.7
August	41.1	10.9	14.8	21.5	43.8	23.3	155.4
September	34.2	4.4	7.1	4.0	48.7	18.3	116.7
October	62.7	0.0	0.0	2.3	4.6	4.1	73.7
November	19.5	0.0	0.0	0.0	43.4	0.0	62.9
December	53.4	0.0	0.0	0.0	12.9	0.0	66.3
Annual	**469**	**44**	**70**	**141**	**435**	**109**	**1,270**

Large Volume Customers

The City of Shoreview does not have any one customer or use that consumes more than five percent of total water production. **Table 9C-4** summarizes 2007 annual water usage for customers that consume the greatest share of total production.

Table 9C-5. Large Volume Customers - 2007

Name	Annual Consumption	Gallons/Day	Percent of Water Demand
City of North Oaks	10,601,700	29,046	0.8 %
Wells Fargo 1	9,099,600	24,930	0.7 %
Wells Fargo 2	7,834,820	21,465	0.6 %
Hampton Inn	7,453,650	20,421	0.5 %
Moundview School District	6,745,900	18,482	0.5 %
Village at Rice Creek Condos 1	6,075,500	16,645	0.4 %
Deluxe, IBC1 # 1	5,277,100	14,458	0.4 %
Deluxe, IBC1 # 2	5,254,300	14,395	0.4 %
Village at Rice Creek Condos 2	5,035,400	13,796	0.3 %
Exxon, Shoreview	4,675,800	12,810	0.3 %

Source: Finance Department Utility Billing Records

Water Use by Customer Category

Monthly water use by residential and non-residential customers is summarized in **Table 9C-4**.

Table 9C-6. 2007 Water Use

Month	Residential	Other	Total
January	52,716,294	5,507,115	66,930,000
February	36,192,732	5,642,711	60,420,000
March	49,076,150	13,738,816	66,204,000
April	44,609,336	6,349,596	77,549,000
May	34,969,434	7,017,481	123,958,000
June	61,123,786	22,193,137	174,810,000
July	116,399,387	19,141,901	225,711,000
August	110,799,951	22,935,416	155,381,000
September	141,408,857	37,103,645	116,667,000
October	108,679,407	15,867,666	73,667,000
November	53,048,882	16,860,814	62,840,000
December	52,791,736	18,233,305	66,280,000
Total	**861,833,952**	**190,591,603**	**1,270,427,000**

Source: Finance Department Utility Records. This table is based water billed in a given year. Annual pumpage and billing records differ slightly because of the delay between actual water use and billing.

Inter-Community Water Service

The City of Shoreview has inter-community water service agreements with the cities of Arden Hills, Lino Lakes, North Oaks, Vadnais Heights and Roseville. The City provides municipal water to a few individual properties within each of these cities except for Lino Lakes and Roseville. **Table 9C-6** summarizes 2007 water usage in each inter-community service area.

Table 9C-7. Inter-Community Water Use

City	Range of Land Uses	2007 Water Usage	Percent of Total Annual Usage
North Oaks	Institutional/Commercial	10,601,700	0.8 %
Arden Hills	Institutional	8,641,131	0.7 %
Vadnais Heights	Residential	1,792,000	0.1 %

Source: Finance Department Utility Records

Analysis of Future Needs

Water Level and Impacts from Appropriations

The lowest allowable water level for a well is the top of the aquifer. However, the Minnesota DNR encourages cities to manage aquifer resources in a way that prevents supply issues from developing. For proper management of the aquifer resources, the City should pump at rates that allow for long-term recharge of the aquifer. Short-term changes in water levels due to wet and dry years are expected.

The City of Shoreview collects water level data for assessment of long-term trends in water levels. The collected data indicate long-term water levels are relatively constant and that the City is not pumping from the aquifer at excessive rates. Please refer to **Table 9C-1** for current drawdown data for the City's water supply wells.

Projected Water Use

Shoreview's population is expected to grow slightly over the next 20 years to 28,500 in the year 2010; 29,000 in the year 2020; and 29,000 in the year 2030. At the same time, developed commercial and industrial acreage has grown from 345 acres in 1999 to about 420 acres in 2008. Expected growth is limited by the low amount of vacant land. The City estimates that commercial and industrial areas will expand to about 440 acres in the year 2010; 490 acres in the year 2020; and 510 acres in the year 2030. **Table 9C-7** summarizes projected water demands through 2020.

Table 9C-8. Projected Water Demand

	Flows (thousand gallons/day)				
Year	**Residential**	**Commercial**	**Industrial**	**Avg-Day**	**Max-Day**
2000	2,144	741	181	3,066	8,400
2001	2,219	767	187	3,174	11,108
2002	1,950	674	165	2,788	6,780
2003	2,502	865	211	3,578	11,840
2004	2,158	746	182	3,085	8,370
2005	2,189	756	185	3,130	8,900
2006	2,294	793	194	3,280	9,770
2007	2,183	739	168	3,090	9,271
2008	2,198	744	169	3,111	9,333
2009	2,213	749	170	3,132	9,396
2010	2,227	754	171	3,152	9,457
2015	2,243	759	173	3,174	9,523
2020	2,258	764	174	3,196	9,589
2025	2,307	781	177	3,265	9,796
2030	2,356	798	181	3,335	10,005

Adequacy of Resources to Meet Current and Projected Demands

The Prairie du Chien-Jordan aquifer is currently being used as the City's water supply source and appears to be adequate for Shoreview's foreseeable future water needs. Conservative forecasts of future water demand and storage requirements indicate that the City's emergency flow capacity should be adequate until the year 2030.

Of the aquifers underlying Shoreview, only the Mt. Simon formation has specific limitations on both non-essential use and future well installation/development. It is believed that the Mt. Simon aquifer has very little hydraulic connection with the shallow groundwater systems and overlying streams. Because of this, the Minnesota DNR discourages non-essential use of the aquifer and would likely prohibit the City of Shoreview from installing Mt. Simon wells. However, the shallower Prairie du Chien-Jordan aquifer will likely provide an ample supply of groundwater for the City of Shoreview.

Adequacy of Existing Water System to Meet Current and Projected Demands

Shoreview's municipal water distribution system has been periodically studied and improved since the 1970s, with the most recent major improvement occurring in 1990. That improvement consisted of optimizing the well field connections and providing centralized chemical treatment/additions. An underground reservoir and a separate booster pumping station were also constructed. A system-wide study performed at that time determined that the existing infrastructure was adequate for the foreseeable development potential remaining in the City.

The City completed an additional system-wide analysis and demand simulation (computer model) of the distribution/storage system in July 1998. The results of that recent analysis indicate that the City has a maximum production capacity of 9,231 gallons per minute (gpm), an amount sufficient to adequately serve both the domestic and fire flow demand of the population and land uses projected to the year 2015. A recently conducted study (2007) of the water demand and supply projections indicate that the City has capacity to adequately serve anticipated demand through at least 2030. The City will continue to analyze its water production and distribution system on a regular basis and will program system upgrades or component replacements as well as routine maintenance projects as necessary.

The City of Shoreview has existing inter-community water service agreements with a number of adjoining cities. At this time, no neighboring communities have requested any additional water main extensions, and the City is not aware of any potential requests from these communities. Any future requests for additional inter-community water service will be evaluated based on the impact to the municipal water system infrastructure and water supply.

Proposed Expansions

Shoreview currently has no major plans to expand its water production capabilities as the existing well, booster station and storage facilities are determined to be adequate for the population and land uses projected to the year 2030. Minor expansions or extensions of the municipal water distribution system may become necessary over time to serve infill development.

The City is planning other maintenance or operations improvements to the municipal water distribution system. The City has rehabilitated one of its elevated storage tanks (originally constructed in 1983), and rehabilitated the interior of the bowl on the other tank (originally constructed in 1973). The City has installed a modern Supervisory Control and Data Acquisition (SCADA) system to monitor and control various water distribution and sanitary sewer functions. Potential future water system improvements also include the installation of a treatment facility.

Impact on Other Comprehensive Plan Elements

Other elements of the *Comprehensive Plan* that may be affected by this water supply plan include Land Use, Housing, Economic Development and Natural Resources. The ability to provide a safe public water source influences how the land is used, maintains quality of life within the City's neighborhoods and supports economic development. In addition, the aquifer is better protected from contamination since private wells are not needed to serve residences and businesses.

The City's water production and distribution system have been designed to provide service to the projected land uses through the year 2030. Expansion of the system will occur to accommodate infill development, as necessary.

Groundwater Protection and Management

Groundwater serves as the source of the municipal water supply and must be managed for the City's long-term needs and to protect the water source from contamination. In addition, shallow groundwater contamination can affect private drinking and irrigation wells and degrade surface water quality.

The City of Shoreview is currently working with the Ramsey Conservation District as a partner in the revision of the Ramsey County Groundwater Protection Plan. Groundwater is recognized as a vital resource that is key to Shoreview's current well-being and future development.

This plan will represent the efforts of the county's municipalities, watershed management organizations, county agencies, and state agencies working with the Ramsey Conservation District to promote groundwater protection. The Groundwater Protection Plan is expected to be written by January 2009 and adopted by that December.

The Plan will include several steps local units of government should take to safeguard the quality and adequate supplies of the vital groundwater resource. Conclusions of the Groundwater Protection Plan are expected to be adopted by the local units of government in Ramsey County.

Shallow Groundwater

The City's municipal water is obtained from a deep aquifer over 400 feet below the ground surface. Subsurface geology isolates this deep aquifer from the shallow groundwater that supplies the large majority of private wells. About 570 residential dwelling units in the City are served by private wells. These private wells are more vulnerable to contamination from surface and shallow sources such as failing septic systems or polluted runoff. Land use (such as industrial uses) can also affect shallow groundwater quality. Shallow groundwater can carry nutrients and contaminants to nearby surface waters.

Oversight of private wells lies with the Minnesota Department of Health. The City can help prevent contamination of shallow groundwater through continued monitoring of individual sewage treatment systems. (See Section 9B, Sanitary Sewer System, for more information on the management of individual sewage treatment systems.)

Municipal Water Supply

Water supply protection is an essential part of managing the municipal water system. The City is currently overseeing the management of isolation distances of wells and potential contaminant sources. Shoreview's existing water supply system, consisting of deep aquifer wells, raised storage, chlorination, fluoridation, etc. has been recently modeled and found likely to be capable of meeting demand for the next 20 to 30 years. Accordingly, the City is not programming the construction of additional water supply wells at this time.

The City of Shoreview is currently ranked 254th on the latest Minnesota Department of Health priority list for wellhead protection. The City is required to prepare a Wellhead Protection Plan in conformance with the relevant sections of The Minnesota Groundwater Protection Act of 1989, the 1986 Amendments to the Safe Drinking Water Act, Minnesota Statutes 103I.101 and Minnesota Rules, Chapter 4720, by June of 2012.

Emergency Management

Interconnections with Adjacent Suppliers and Sources

Four permanent connections with adjoining communities presently exist:

- A six-inch connection with the community of Circle Pines at the intersection of County Road J and Fernwood Street.
- An eight-inch connection with the City of Arden Hills at the intersection of Lexington Avenue and Grey Fox Road.

- An eight-inch connection with the City of Roseville at the intersection of Lexington and County Road D.
- An eight-inch connection with the City of Lino Lakes at the intersection of County Road J and Grotto St.

These connections are normally closed but in emergency situations can be opened to help meet the adjacent communities and /or the City of Shoreview's emergency needs. There are no plans at this time to create additional interconnections.

Alternative Water Sources

No viable/operable sources of surface water are currently available to the City of Shoreview. Also, there are currently no operative alternative sources of water for the City. In the event that a well became contaminated, the City could have a portable treatment facility developed in a relatively short period of time to treat water to drinking water standards.

Allocation Procedures

In the event of water shortage, the City would allocate water based on the following priorities. These priorities were established according to Minnesota Statutes 103G.216 and modified to allow their practical application to uses within the City of Shoreview.

- First Priority. Domestic water supply (as defined in Minnesota Rules 6115) including use for general household purposes for human needs such as cooking, cleaning, drinking, washing and waste disposal.
- Second Priority. Water uses involving consumption of less than 10,000 gallons per day.
- Third Priority. Water uses exceeding 10,000 gallons per day.
- Fourth Priority. Non-essential uses (as defined in Minnesota Statutes 103G.216) including lawn sprinkling, vehicle washing, golf course and park irrigation and others.

The City will allocate water equitably within each water use priority and customer category. The demands associated with high-priority water use, e.g., domestic water supply, must be met prior to the allocation of water to subsequent lower priority groups. Non-essential uses of water are the lowest priority and will be the first subject to restrictions. The City's quick response to restrict non-essential water uses during periods of limited supply will help protect domestic and economic uses of water. For additional information, please refer to the *Conservation and Emergency Management Plan for the Shoreview Water System* prepared in October 2007 and approved by the Metropolitan Council in March 2008.

Demand Reduction

The City of Shoreview has adopted and enforces an odd/even lawn sprinkler use regulation during the summer months to reduce water demand. During water shortages, other demand reduction measures may be required, and the City employs several standard short-term demand

reduction procedures based on associated trigger. These measures are progressively more stringent and are to be used as the length or severity of an emergency warrants. Standard reduction measures include:

- Voluntary Reduction Measures. Encourage voluntary conservation via public service announcements, "bill stuffers", or notices in local paper.

- Sprinkling Bans. Total ban in extreme emergency.

- Water Allocation Restrictions. Based on the severity of the emergency and the water use priorities.

Demand reduction measures will be triggered based on the City's well firm capacity. Well firm capacity is defined as the water utility's production capacity with the highest producing well out of service. Well firm capacity is not a fixed number and may change based on the type of emergency if, for example, a well is rendered inoperable because of the emergency at hand.

Table 9C-9 lists short-term demand reduction measures and associated triggers. The triggers are provided as a guideline, and the listed demand reduction measures can be implemented prior to these triggers if deemed appropriate by experienced City water personnel. The Shoreview City Council has established a policy to begin considering demand reduction measures whenever water demand is expected to exceed 75 percent of the City's water capacity.

Table 9C-9. Demand Reduction Triggers

Demand Reduction Measure	Trigger
Voluntary Reduction Measures	Always
Odd/Even Sprinkling Ban	May 15th until September 15th each year.
Total Sprinkling Ban	When it is anticipated that pumpage demand may exceed 112% of the well firm capacity OR when an odd/even sprinkling ban is unable to keep the pumpage demand below 100% of the well firm capacity.
Constraints on Second and Third Priority Water Uses (site and emergency specific)	When it is anticipated that pumpage demand may exceed 148% of the well firm capacity OR a total sprinkling ban is unable to maintain the pumpage demand below 100% of the well firm capacity.

Source: *Conservation and Emergency Management Plan for the Shoreview Water System*, October, 2007.

For additional information, please see the *Conservation and Emergency Management Plan for the Shoreview Water System* prepared in October 2007 and accepted by the Metropolitan Council in March 2008.

Enforcement

Water use restriction enforcement procedures are specified in City Ordinance No. 773. Water use restriction will become more stringent as an emergency progresses. Voluntary reduction measures are encouraged by the City. Water use restrictions (e.g., odd/even ban) are enforced by the City staff. Total sprinkling bans and other allocation reductions will be monitored by the water utility staff and enforced as needed. Enforcement includes fines, and other penalties. Customers are notified of water use restrictions through the City website, the newspaper, official City newsletters and/or public announcements as appropriate.

Previous Supply Problems

The City has experienced no major failures in the history of the water system. However, failures within Shoreview's water supply and distribution system can occur. The water utility staff maintains an adequate supply of repair parts, equipment, personnel and other resources for both the distribution system and the well pumphouses. Older portions of the distribution system are monitored closely for leaks, breaks and other failures. The Shoreview municipal water supply system utilizes the same primary power source as the rest of the city. In the event of a power outage, generators are used as necessary. Future plans for water system upgrades include auxiliary power sources for the well houses.

Water Level and Withdrawal Records

Historical records of water levels are not available. The City plans to maintain such records in the future as part of long-range maintenance of well water levels. The City plans to monitor aquifer recovery associated with the next period of high usage. The DNR also recommends the installation of observation wells to assess the short-term and long-term resource impacts from groundwater withdrawals. The City does not currently maintain observation wells for the purposes of monitoring deep aquifer conditions.

Water Conservation

Conservation and Demand Management

Conservation can be used to reduce the demand for water, improve the efficiency of water use and reduce the loss and waste of water. In some cases, conservation can actually be an alternative to developing additional sources of water to meet peak demands for non-essential water use. Reducing the peak water use is the ultimate objective of conservation. Thus, conservation is a more general and long-term approach that works towards the same objective as

short-term demand reduction measures. Reducing peak water use may delay or reduce additional source development and water storage requirements. Conservation is most easily measured by reductions in residential and overall per capita water use.

Metering

All Shoreview water system users except for the Fire Department are metered, and no users (permanent or temporary) will be added to the system without a meter. Meters are read monthly. Meters for the City's larger accounts are monitored regularly and recalibrated, repaired (or replaced) if needed. Other meters may be tested, recalibrated or replaced if billing data indicates a significant change in use.

Unaccounted-for Water

Unaccounted-for water is the difference between the volume of water sold and the volume of water extracted from the source. Losses are typically due to water main leakage and breaks, routine hydrant flushing to remove iron and manganese precipitates in water mains and other municipal services. The City may consider metering these municipal services when practical.

Current water accounting practices at Shoreview do not provide monthly assessments of the City's unaccounted-for water. This is a characteristic inherent to the meter reading/billing cycle. In the event that unaccounted-for water becomes a significant share of the City's water use, the City will consider adopting a formal leak detection program and/or changes to the metering/billing system.

Water Conservation Potential

Shoreview's average residential per capita water use for the last 10 years was 86 gallons per capita per day (gpcd). Data from the Metropolitan Council indicate that this figure is below the mean residential per capita water use for the Twin Cities Metropolitan Area (88 gpcd in 2004). The trend in residential per capita water use over the last several years has been generally downward since the drought year of 1988. The average overall per capita use (i.e., including non-residential use) for Shoreview's serviced population is approximately 114 gpcd for the last 10 years, based on total pumpage. According to the Met Council report [Metropolitan Council Water Demand and Planning Report for the Twin Cities Metropolitan Area, May 2004], the average total per capita day demand for the Twin Cities Metropolitan Area is 100 gpcd for the year 2002. The total per capita demand for the City of Shoreview is much higher than the average of Twin Cities Metropolitan Area. The increase in total per capita demand is due to the large amount of water registered as unaccounted-for water. The City has made regulations and policies that will help to bring their unaccounted-for water usage down and that will eventually bring the total per capita demand closer to the average of Twin Cities Metropolitan Area.

Long-term conservation can be facilitated through:

- Public Education. Educating the public can serve to encourage users to voluntarily incorporate water saving habits and tools into their lifestyle. There is definitely potential for increasing Shoreview's conservation through this avenue, particularly if residents can be encouraged to replace inefficient water fixtures.

- Water System Operation and Maintenance. Improving upon the existing water system's operation and maintenance (O&M) procedures can increase the water conserved throughout a given year.

- Water Costs. By incorporating costs associated with water conservation programs, adjusting the water rate structure and ensuring that all customers are paying for the water they use, Shoreview could further encourage conservation. Additionally, a primary incentive for reducing commercial/industrial water use is sewer charges.

Education and Fixture Retrofit

The City makes an on-going effort to educate the public on the benefits of water conservation. The education process includes: regular "bill stuffers" (available from AWWA), participation in National Drinking Water Week and direct mailings to encourage voluntary water reduction measures. The City also periodically posts conservation tips in City buildings.

Public education pertaining to timed sprinkling systems could help curb peak water use by encouraging that timers be set to water during off-peak water use hours. Residents who manually water their lawns can also be encouraged to do so during off-peak hours. During sprinkling bans and emergency periods, public service announcements will be issued in the local paper, and special mailings will be issued to inform the customers.

The passage of the Energy Policy Act in 1992 resulted in uniform efficiency standards for virtually all household fixtures manufactured after January 1994. Associated State and Federal Plumbing Codes require that all new homes and retrofits of existing homes utilize water efficient fixtures. These regulations will help ensure long-term improvements in water use efficiencies.

Water System Operation and Maintenance

The City of Shoreview performs preventive maintenance to reduce water loss, including:

- The systematic replacement of cast-iron and other outdated construction materials used for water main construction as opportunities arise through infrastructure improvement projects.

- Seasonal water main flushing, and hydrant and valve inspection and exercising.

    - Annual well column, pump, line shaft and motor inspection and repair when appropriate.

Water Rates

The City of Shoreview currently encourages water conservation by employing an inclining block rate structure. Water rates as of 2008 for residential users are $0.816 per thousand gallons (kgal) for up to 15,000 gallons, $1.644 per kgal for 15,000 to 30,000 gallons, and $2.608 per kgal for over 30,000 gallons. Commercial users pay $1.644 per kgal.

The rate structure is intended to pay for the true cost of supplying, treating and delivering the water including maintenance, billing and all planned water system capital improvements. The City reviews water rates annually.

Goals, Policies, and Recommended Actions

Goals

1. Promote sustainable use of the City's municipal water supply source.

2. Protect the health and economic well-being of the City's citizens by providing safe and dependable water service at a reasonable cost.

3. Operate the City's water service so that it is economically self sufficient and so that rates and reserves allow for an appropriate infrastructure replacement schedule.

Policies

1. Coordinate with the appropriate state and regional agencies to assure the sustainable use of the Prairie du Chien-Jordan aquifer.

2. Remain in compliance with state and federal drinking water standards.

3. Monitor water use to ensure existing wells are adequate to meet demand.

4. Encourage water conservation to reduce the need for additional water supply wells.

5. Continue to plan for short-term and long-term system needs to insure rate stability and the economic self-sustainability of the City's water supply system.

6. Encourage all property owners to connect to the City's municipal water system.

7. Encourage proper capping and sealing of all unused wells to protect groundwater quality, particularly wells that tap into the Prairie du Chien-Jordan aquifer and/or are located within wellhead protection areas.

8. Monitor and reinforce the security of the water source and its physical infrastructure.

Recommended Actions

1. The City will continue to analyze its water production and distribution system on a regular basis and will program system upgrades or component replacements as well as routine maintenance projects as necessary.

2. The City will continue to employ the following water conservation measures:

   - Annual. Odd / even sprinkling restrictions May 15 – Sept 15.
   - Voluntary Reduction Measures. Public service announcements, "bill stuffers", notices in local paper, post information on the City's website.
   - Sprinkling Bans. Odd/even ban or a total ban in extreme emergency.
   - Water Allocation Restrictions. Based on the severity of the emergency and the water use priorities.

3. The City will continue to follow the enforcement procedures for water conservation measures that are specified in City ordinances.

4. The City will continue to maintain drawdown records as part of the long-range maintenance of well water levels to insure sustainable aquifer use.

5. The City may consider monitoring the larger residential accounts (townhouse complexes) more frequently to better assess and address higher than average uses of water.

6. The City may meter municipal services when practical to reduce the amount of unaccounted for water.

7. To ensure the integrity of the public water supply, the City should continue the systematic replacement of cast-iron and other outdated construction materials used for water main construction as opportunities arise through street reconstruction and other infrastructure improvement projects.

8. The City should continue its operation and maintenance activities which include: seasonal water main flushing, hydrant and valve inspection and exercising, annual well column, pump, line shaft and motor inspection and repair when appropriate.

9. The City will prepare a wellhead protection plan in accordance with Minnesota Department of Health requirements and schedule.